# F-35A LIGHTNING II

## FOR FLIGHT SIMULATOR X:ACCELERATION

USER MANUAL

*User manual version 1.1*

*Product version 1.1*

*Build 61-30-1.7 compiled July 28th 2010*

*A copy of this manual is found in the Airplanes/F35A/docs folder*

## REVISION HISTORY

Version 1.05
July 28th 2010
*Initial public release*

Version 1.1
August 18th 2010
- Added wing vapor effect (the effect shows when G force is in excess of 4.5 g's). NOTE: In the previous release, the vapor effect was included for a mistake. In fact it was a provisional file which was a copy of team KBT's F/A-18E Super Hornet. My apologies to the authors.
- Added "whiskers" effect (the effect shows when the AoA is in excess of 25 degrees), as seen on real F-35 pictures.
- Added visual model with two external tanks + 2 JDAMs + 2 Sidewinders
- Fixed minor texturing problem with main gear tires
- Fixed (mock) gun rounds (internal gun has 180 rounds only)
- Fixed minor graphics glitch in the FUEL panel
- Optimized MFD rendering resolution
- Minor visibility condition oprimizations
- Fixed minor texturing problem with ejection gear handle
- Added different pilot face textures for different aircraft
- Fixed emergency landing gear system modeling
- Added alternate aircraft.cfg with incorrect landing gear contact points but no micro-oscillations
- Updated manual accordingly and fixed miscellaneous typos.

# WELCOME

The Joint Strike Fighter (JSF) Program, formerly the Joint Advanced Strike Technology (JAST) Program, is the Department of Defense's focal point for defining affordable next generation strike aircraft weapon systems for the United States Navy, Air Force and Marines, and several allied countries. At present Great Britain, Italy, the Netherlands, Turkey, Canada, Australia, Denmark and Norway are involved in the program and committed to adopt the F-35, while other countries are likely to join in the future. The focus of the program is affordability -- reducing the development cost, production cost, and cost of ownership of the JSF family of aircraft.

The JSF will fulfill stated Service needs as follows:

- U. S. Navy First day of war, survivable strike fighter aircraft to complement F/A-18E/F
- U.S. Air Force Multirole aircraft (primary-air-to-ground) to replace the F-16 and A-10 and complement the F/A-22
- U.S. Marine Corps STOVL aircraft to replace the AV-8B and F/A-18 as their only strike fighter
- United Kingdom Royal Navy & Royal Air Force STOVL aircraft to replace Sea Harriers & GR.7s as a supersonic strike fighter
- Other Countries Potential JSF customers include current operators of F-16, F/A-18, and AV-8B

This software provides, within the Microsoft Flight Simulator X:Acceleration environment, a simplified simulation of the F-35A, the Conventional Take-Off and Landing variant.

## MINIMUM HARDWARE REQUIREMENTS

Due to the high-detail model and textures, we suggest to use the F-35 on systems that meet or exceed the following requirements:

CPU: 2.4GHz dual core processor or better

GPU: at least 384Mb dedicated memory

RAM: 3.0Gb

Hard Disk: 700Mb required for installation

**IMPORTANT! This add-on is designed to work with FLIGHT SIMULATOR X AND ACCELERATION package installed. Flight Simulator X AND the ACCELERATION package (or Flight Simulator X:Gold Edition) are REQUIRED.**

## INSTALLATION

Follow the installer instructions on screen. Make sure that the Flight Simulator X folder is detected properly, otherwise the files may be installed in a wrong folder.
If you wish to install the files manually, unpack all the files in a folder of your choice then move all the files in the Effects folder in the Flight Simulator X/Effects folder and all the files in the SimObject folder in the Flight Simulator X/SimObject folder, maintaining the exact folder structure and names.

NOTE FOR ADVANCED USERS: The visual models employ high-definition textures (up to 4096x4096). To enable these textures, you should modify the FSX.cfg by changing the “TEXTURE_MAX_LOAD” entry to 4096 (TEXTURE_MAX_LOAD=4096). See FAQ section for more information.

# THE REAL F-35 LIGHTNING II

The F-35 Lightning II is a fifth-generation, single-seat, single-engine stealth multirole fighter that can perform close air support, tactical bombing, and air defense missions. The F-35 has three different models: the F-35A is a conventional takeoff and landing variant, the F-35B is a short take off and vertical-landing variant, and the F-35C is a carrier-based variant.

*AIRCRAFT DATA*

**General Characteristics**
Crew: 1
Length: 51.4 ft (15.67 m)
Wingspan: 35 ft (10.7 m)
Height: 14.2 ft [nb 1] (4.33 m)
Wing area: 460 ft² (42.7 m²)
Empty weight: 29,300 lb (13,300 kg)
Loaded weight: 44,400 lb (20,100 kg)
Max takeoff weight: 70,000 lb (31,800 kg)
Powerplant: 1× Pratt & Whitney F135 afterburning turbofan
Dry thrust: 28,000 lbf (125 kN)
Thrust with afterburner: 43,000 lbf (191 kN)
Internal fuel: 18,480 lb (8,382 kg)

**Performance**
Maximum speed: Mach 1.67 (1,283 mph, 2,065 km/h)
Range: 1,200 nmi (2,220 km) on internal fuel
Combat radius: 610 nmi (1,110 km) on internal fuel
Service ceiling: 60,000 ft (18,288 m)
Rate of climb: classified (not publicly available)
Wing loading: 91.4 lb/ft² (446 kg/m²)
g-Limits: 9 g

**Armament**
*Guns:* 1 × GAU-22/A 25 mm (0.984 in) cannon internally with 180 rounds
Hardpoints: 6× external pylons on wings with a capacity of 15,000 lb (6,800 kg) and 2 × internal bays with 2 pylons each for a total weapons payload of 18,000 lb (8,100 kg) and provisions to carry combinations of:
Missiles:
*Air-to-air:* AIM-120 AMRAAM, AIM-132 ASRAAM, AIM-9X Sidewinder, IRIS-T
*Air-to-ground:* AGM-154 JSOW, AGM-158 JASSM
*Bombs:* Mark 84, Mark 83 and Mark 82 GP bombs
Mk.20 Rockeye II cluster bomb; Wind Corrected Munitions Dispenser capable; Paveway-series laser-guided bombs; Small Diameter Bomb; JDAM-series;B61 nuclear bomb.

**Avionics**
AN/APG-81 AESA-radar; Electro-Optical Targeting System (EOTS); AN/AAQ-37 distributed aperture system (DAS); AN/ASQ-239 “Barracuda” Electronic Warfare system; Multifunction Advanced Data Link

# FEATURES AND LIMITATIONS OF THE SIMULATED F-35 LIGHTNING II

In order to provide a higher quality product, and keep the development time within reasonable limits, this package depicts only the F-35A, that is the Conventional Take-Off and Landing version.
While we tried our best to provide a realistic F-35 for Flight Simulator, this rendition of the F-35 Lightning II suffers from several limitations due to different factors.
As the real aircraft is still in development, and detailed and accurate drawings are not publicly available, the virtual rendition may be inaccurate in some details.
Also, since the real aircraft is equipped with a revolutionary avionics suite, most of the exotic features are missing from this simulation.
Last, obviously, while the flight modeling has been kept as close as possible to the publicly available data and reflect the pireps, we cannot guarantee any level of accuracy.

Any known inaccuracy, artistic license or difference from the real aircraft or any major limitation of this package, either due to Flight Simulator X restrictions or due to product design, will be highlighted in the this manual.

## *FEATURES*

**Simulation platform:**
Microsoft Flight Simulator X:Acceleration or Gold versions. Will not work correctly or at all with other Flight Simulator versions.

**External visual model:**
High detail FSX:Acceleration native visual models, depicting the initial prototype AA-1, the weight optimized prototype AF-1 and production F-35A (without external loads / with external JDAMs and AIM-9Ls / with external CBU and AIM-9Ls) Due to the high polycount, the model may not be suitable as AI plane, nor for large multiplayer formation flights.

**Virtual cockpit model:**
Accurate visual model based on publicly available images and information.
Cockpit layout and textures based on high definition photos of the F-35 AA-1 prototype. Some canopy details based of F-35 BF-02.
Custom collimated Virtual HUD and .XML code.

**Flight modeling:**
Custom flight model based on publicly available aircraft and engine performance data, test pilots reports and interviews. Where estimated had to be made, the rationale has been engineering judgment against F-16 performance.

**Sound:**
No custom sound package is provided.
Sound is aliased from the default Acceleration Hornet; sound may be missing if the Acceleration package is not installed correctly.

## GENERAL DESIGN

The F-35 appears to be a smaller, slightly more conventional, single-engine sibling of the sleeker, twin-engine F-22 Raptor, and indeed drew elements from it.
Some of the improvements over current-generation fighter aircraft are:

- Durable, low-maintenance stealth technology, using structural fiber mat instead of the high-maintenance metallic paint of legacy stealth platforms.

- Integrated avionics and sensor fusion that combine information from off- and on board sensors to increase the pilot's situational awareness and improve target identification and weapon delivery, and to relay information quickly to other command and control (C2) nodes.

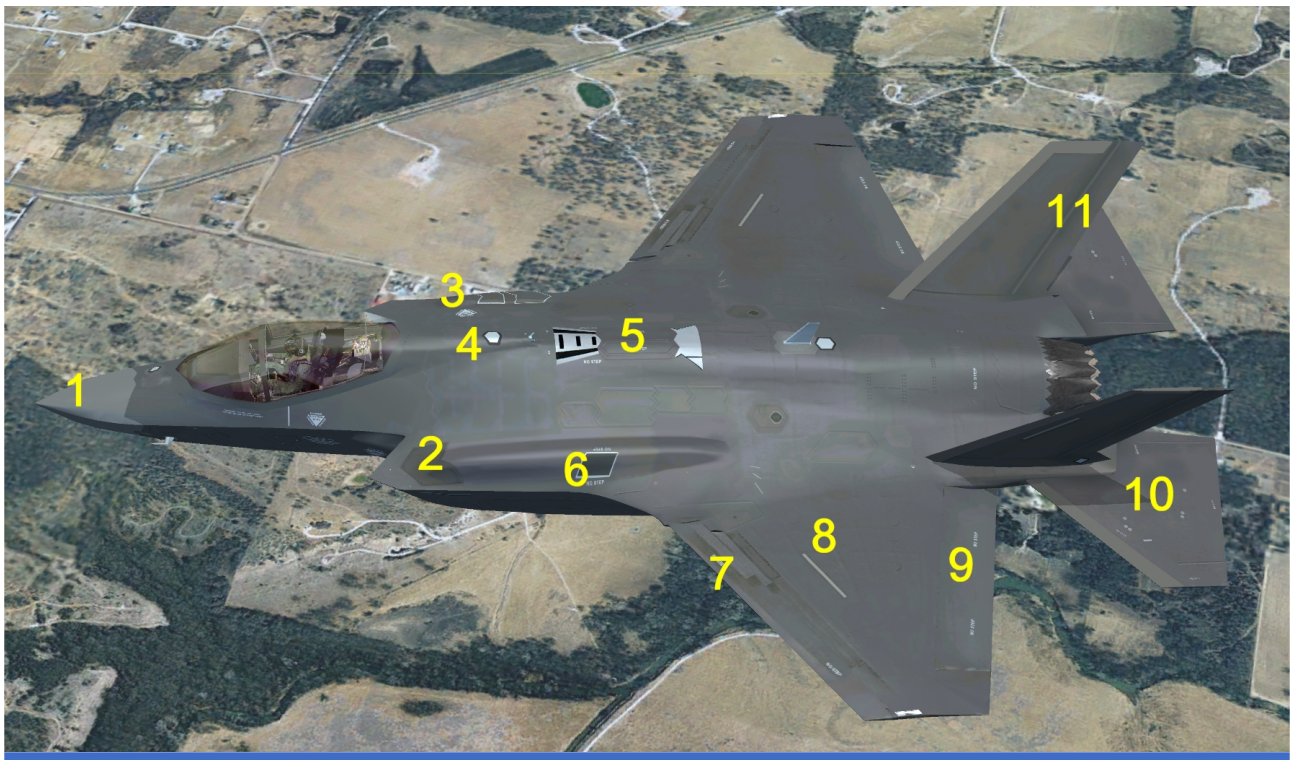
- High speed data networking including IEEE 1394b and Fibre Channel.

- The Autonomic Logistics Global Sustainment (ALGS), Autonomic Logistics Information System (ALIS) and Computerized Maintenance Management System (CMMS) help ensure aircraft uptime with minimal maintenance manpower.

- The majority of the structural composites in the F-35 are made out of bismaleimide (BMI) and composite epoxy material.

***In-game screenshot of the F-35A parked at Edwards AFB (with optional parking eye candy shown, and refuel receptacle open)***

*All the visual models are rendered with high-definition textures up to 4096x4096 pixels in resolution and feature animated control surfaces, landing gear, engine nozzle and canopy. Also, each model includes some cosmetic-only optional animations, linked to the Flight Simulator X "auxiliary exits" controls . In detail: exit 2 toggles the opening of the refuel receptacle (as shown in picture – this can be either activated by pressing SHIFT+E then 2 or by the FUEL management functions of the MFD in the virtual cockpit); exit 3 toggles the opening of the internal weapon bays doors (not shown in the picture above – this can be activated by pressing SHIFT+E then 3 or by the SMS functions of the MFD in the virtual cockpit); last exit 4 (shown activated by SHIFT+E and then 4) makes the remove-before-flight ribbons, engine cover and wheel chocks to appear, and the pilot to disappear – this is an eye-candy only to take screenshots and has no effect on the flight models.*



## DISTINCTIVE F-35 FEATURES

1 – APG-81 Active Electronically Scanned Array radar (all versions)
2 – GAU 22/A internal gun nozzle door - in order to maintain stealthiness, the gun nozzle is hidden by a sliding door (not animated). Only the F-35A has an internal gun. F-35B and -C have optional ventral gun pods.
3 – Auxiliary air intake
4 – AN AAQ/37 Distributed Aperture System sensors – several sensors scattered around the plane provide 360° spherical situational awareness to the pilot.
5 – Refuel receptacle location (F-35A only; F-35B and -C have retractable refuel probes nearby the canopy).
6 – Gun vent
7 – Power by wire leading edge flap, with integrated RWR sensors*
8 – Formation lights
9 – Flaperon*
10 – Taileron
11 – Tail rudder*
12 – APU exhaust (note: exhaust is located on the top surfaces in the AA-1 prototype and F-35C variant)
13 – Fuel dump valve
14 – Emergency tailhook (F-35A only; F-35B has no tailhook, while the F-35C has a different, more robust tailhook for carrier operations)
15 – Internal weapon bays. The F-35 has room for two AIM120 air-to-air missiles and two 2000lbs JDAM bombs. F-35 has identical weapon bays, while the F-35B has slightly smaller volume – to make room for the Direct Lift VTOL system.
16 – Electro-Optical targeting system.

***** *The F-35 has no "physical" speed brakes – a "virtual brake" (via rudders and flaps) is provided instead.*

## F-35 VARIANTS

The real F-35 is planned to be built in three different versions to suit the needs of its various users. The F-35A is the conventional take-off and landing (CTOL) variant, the F-35B is the Short Take Off and Vertical Landing (STOVL) variant, and the F-35C is the CATapult Launch But ARrested Landing (CATOBAR) version for U.S.Navy carriers.
**In this Flight Simulator X rendition, only the F-35A is depicted – the text below is given for general information only and does not apply to the simulation.**

**F-35A**
The CTOL variant intended for the US Air Force and other air forces. It is the smallest, lightest F-35 version and is the only variant equipped with an internal cannon, the GAU-22/A. The F-35A is expected to match the F-16 in maneuverability, instantaneous and sustained high-g performance, and outperform it in stealth, payload, range on internal fuel, avionics, operational effectiveness, supportability and survivability. It also has an internal laser designator and infrared sensors, equivalent to the Sniper XR pod carried by the F-16, but built in to remain stealthy.
The A variant is primarily intended to replace the USAF's F-16 Fighting Falcon, beginning in 2013, and the A-10 Thunderbolt II starting in 2028.

**F-35B**
Similar in size to the A variant, the B sacrifices some fuel volume to make room for the vertical flight system. Takeoffs and landing with vertical flight systems are by far the riskiest, and in the end, a decisive factor in design. Like the AV-8B Harrier II, the B's guns will be carried in a ventral pod. Whereas F-35A is stressed to 9 g, the F-35B is stressed to 7 g. Unlike the other variants, the F-35B has no landing hook; the "STOVL/HOOK" button in the cockpit initiates conversion instead of dropping the hook.
The British Royal Air Force and Royal Navy plan to use this variant to replace their Harrier GR7/GR9s. The United States Marine Corps intends to purchase 340 F-35Bs to replace all current inventories of the F/A-18 Hornet (A, B, C and D-models), and AV-8B Harrier II in the fighter, and attack roles.
One of the British requirements was that the F-35B design should have a Ship-borne Rolling and Vertical Landing (SRVL) mode so that wing lift could be added to powered lift to increase the maximum landing weight of carried weapons.The U.S. Marines are investigating the use of the SRVL method to operate F-35Bs from CVNs without disrupting carrier operations as the landing method uses the same pattern of approach as wire arrested landings.However the aircraft is able to "bring back" 2 x 1K JDAM, 2 x AIM-120 and reserve fuel to a vertical landing.
The F-35B was unveiled at Lockheed Martin's Fort Worth plant on 18 December 2007,and the first test flight was on 11 June 2008.The B variant is expected to be available beginning in 2012.

**F-35C**
The F-35C carrier variant has a larger, folding wing and larger control surfaces for improved low-speed control, and stronger landing gear and hook for the stresses of carrier landings. The larger wing area allows for decreased landing speed, increased range and payload, with twice the range on internal fuel compared with the F/A-18C Hornet, achieving much the same goal as the heavier F/A-18E/F Super Hornet.
The United States Navy will be the sole user for the carrier variant. It intends to buy 480 F-35Cs to replace the F/A-18A, B, C, and D Hornets. The F-35C will also serve as a stealthier complement to the Super Hornet. The first production F-35C was rolled out on 29 July 2009.

## F-35A FLIGHT MODEL AND VISUAL VARIATIONS

This package contains five different visual models, some of which come with different texture sets, for a total of nine different visual model variations.
The depicted models include the initial F-35 prototype (AA-1), the first two development aircraft (AF-01 and AF-02) and, albeit somewhat still fictional, operational F-35A.
We did our best to provide good and realistic visual models. However, since detailed drawings are not publicly available, there may be minor discrepancies and mistakes.
All the visual models feature high-resolution photoreal textures (up to 4096x4096 pixel) with self shadowing, reflections and bump mapping.
However, the visual models are not 100% “DirectX 10 preview” compatible – meaning that while they have been compiled to be fully Flight Simulator X:Acceleration compatible, some minor glitches may occur in DirectX 10, like missing afterburner flame or excessive bloom/halo (e.g. the virtual HUD in the cockpit).
These glitches are not due to errors or mistakes in the model compilation but are intrinsic in FSX, as the Direct X 10 implementation has some glitches and bugs (afterall it is named “preview”).
Still, we hope that these can be considered minor defects that should be acceptable for most DX10 users.

Please note that all the visual models share the same flight model. This flight model is set to replicate the behavior of an F-35A with two 2000lbs JDAMs and two AIM-120s carried internally.
Hence, weight and balance are based on this configuration – some advanced users might want to make changes in the “fuel and payload” menu for a closer estimation of the flight configurations with external weapons. Details of the changes will be provided below.
For obvious reasons we cannot guarantee any level of realism of the flight model, but we did our best by comparing the behavior of the virtual F-35 with all the publicly available data and pilot reports and interview. In case of doubt, assumptions were made – on the basis of engineering judgment based on actual F-16 flight data.
Also, the flight model is “fly-by-wire-like”, that is, in practice, the flight model requires almost no trimming.

***F-35A flying nearby Nellis AFB***
*While we cannot guarantee any level of realism, as most of the flight data is classified, we have tried our best to create a realistic flight model.*

# F-35 AA-1 INITIAL PROTOTYPE

The first F-35A (designated AA-1) was rolled out in Fort Worth, Texas on 19 February 2006. The aircraft underwent extensive ground testing at Naval Air Station Joint Reserve Base Fort Worth in late 2006. In September 2006 the first engine run of the F135 afterburner turbofan in an airframe and tests were completed:this was the first time that the F-35 was completely functional on its own power systems. On 15 December 2006, the F-35A completed its maiden flight.

A modified Boeing 737-300, the Lockheed CATBird is used as an avionic test bed inside of which are racks holding all of F-35's avionics, as well as a complete F-35 cockpit.
On 31 January 2008 at Fort Worth, Texas, Lt Col James "Flipper" Kromberg of the U.S. Air Force became the first military service pilot to evaluate the F-35, taking the aircraft through a series of maneuvers on its 26th flight.

F-35 AA-1, on its 34th test flight, began aerial refueling testing in March 2008. Another milestone was reached on 13 November 2008, when the AA-1 flew at supersonic speeds for the first time, reaching Mach 1.05 at 30,000 feet (9,144 m) making four transitions through the sound barrier, for a total of eight minutes of supersonic flight.

On December 2009, after 3 years of test flights, the AA-1 was retired for battle damage assessment tests (i.e. Live-fire slaughter).

Although the AA-1 flight tests went very well, the aircraft was found to be significantly heavier (by roughly 5000lbs) than the design goal.*
Because of this, an extensive redesign of the aircraft was performed, so that the following prototypes are structurally different – and meet the design goal.
Externally, the distinctive features of the AA-1 are the single-piece nose gear door, the APU exhaust location and the unique livery.

- *- Users that may want to replicate this can add 5000lbs to the weapon station no.6 (central pylon).*

## F-35 AF-01 WEIGHT OPTIMIZED PROTOTYPE

Following the weight reduction initiative, the AF-01 prototype is the first prototype that is structurally representative of the final production CTOL design.
Externally, the most noticeable differences with between AA-1 and AF-01 are the design of the nose gear door (now split in two), the jagged interface between the fuselage and the engine nozzle, the location of the APU exhaust and several details like the type of fuselage probes.
AF-01 took its first flight on November 14th 2009 – an 89 minutes ride during which it flew to 20,000 feet, reached 0.6 Mach, and conducted some 360-degree rolls.
AF-01 is currently deployed at Edwards AFB for flight testing.

## F-35 AF-02 WEAPONS TEST VEHICLE

The AF-02, that took its first flight on April 20th 2010, is the first F-35 to have the internal GAU-22/A 25-millimeter gun system installed. The system features a four-barrel Gatling gun which fires at a rate of 3,000 rounds per minute. The AF-02 will be used to verify the F-35A's ability to carry both internal and external weapons throughout the required flight envelope.
AF-01 is currently deployed at Edwards AFB for flight testing.

## F-35A OPERATIONAL MODEL

In addition to the models of the actual prototypes, this package features also “operational” F-35 models, painted in United States Air Force, 33rd Fighter Wing, 58th Fighter Squadron “Mighty Gorillas”, Eglin AFB.
The 33rd Fighter Wing will be the main training unit for the F-35 and will provide training to pilots and maintainers from all the air forces that will employ the Lightning II.

The operational model is also available with optional external weapon loads. As explained above, these are visual models only and have no effect on the flight model.
However advanced users may want to change the weight and balance of the aircraft, in the “Fuel and Payload” menu.

Also, all the operational models are available in a “clean” (i.e.without roundels or insignias) dark grey livery for repainting. *Note: as the textures are photoreal, no paintkit is available.*

## ARMAMENT AND LOADS

In order to achieve stealthiness, it is required that a fighter plane carries its weapons in internal bays. The F-35 is no exception to this rule. F-35A and -C can carry up to two 2,000 lbs bombs and two air to air missiles, while the F-35B has slightly smaller bays to make room for the VSTOL system. The F-35A features also an internal includes a GAU-22/A four-barrel 25mm cannon with 180 rounds. The same cannon can be fitted as an external pod with 220 rounds in the F-35B and F-35C.
At the expense of being more detectable by radar, many more missiles, bombs and fuel tanks can be attached on four wing pylons and two near wingtip positions. The two wingtip locations can only carry AIM-9X Sidewinder. The other pylons can carry the AIM-120 AMRAAM, Storm Shadow, AGM-158 Joint Air to Surface Stand-off Missile (JASSM) cruise missiles, guided bombs, 480-gallon and 600-gallon fuel tanks. An air-to-air load of eight AIM-120s and two AIM-9s is conceivable using internal and external weapons stations, as well as a configuration of six 2,000 lb bombs, two AIM-120s and two AIM-9s. With its payload capability, the F-35 can carry more weapons payload than legacy fighters it is to replace as well as the F-22 Raptor. Solid-state lasers were being developed as optional weapons for the F-35 as of 2002. It is also expected that the F-35 will have the capability to carry nuclear weapons by 2017.

In this Flight Simulator X rendition, there is an unique flight model that, by default, is set to replicate loads and weight of an F-35 loaded with two 2000lbs JDAMs and two AIM-120s. Advanced users may want to change the flight model loads in the Aircraft>Fuel and payload menu. Load stations are numbered in the same way as the real F-35 (see figure below).
In order to replicate the load of the alternate visual models, users should add:

**F-35 AA-1 Prototype:** as explained in the previous chapter, the initial prototype was heavier than the design goal by roughly 5000lbs. This can be replicated by adding 5000lbs to station no.6.

**F-35A with JDAMs and Sidewinders:** in this configuration the F-35 carries six 2000lbs JDAMs, two AIM-120s and two Sidewinders. To replicate this, add 2275lbs to stations 2, 3, 9 and 10. Also, stations 1 and 11 should be loaded with 375lbs (loads take in account the pylon and the hardpoints)

**F-35A with CBUs and Sidewinders:** this is a proposed configuration for Close Air Support roles. This configuration can be replicated by adding 1385lbs to stations 2, 3, 9 and 10. Stations 1 and 11 should be loaded with 375lbs.

**F-35A with external fuel tanks, JDAMs and Sidewinders:** in this configuration the F-35 carries four 2000lbs JDAMs,two external fuel tanks, two AIM-120s and two Sidewinders. To replicate this add, 2275lbs to stations 2 and 10, and 3825lbs to stations 3 and 9. Also, stations 1 and 11 should be loaded with 375lbs (loads take in account the pylon and the hardpoints)

All the other visual models are covered by the default loads. Please note that weapons are not operational in the game and, unless the changes above are done by the user, will not have any impact in the flight characteristics.

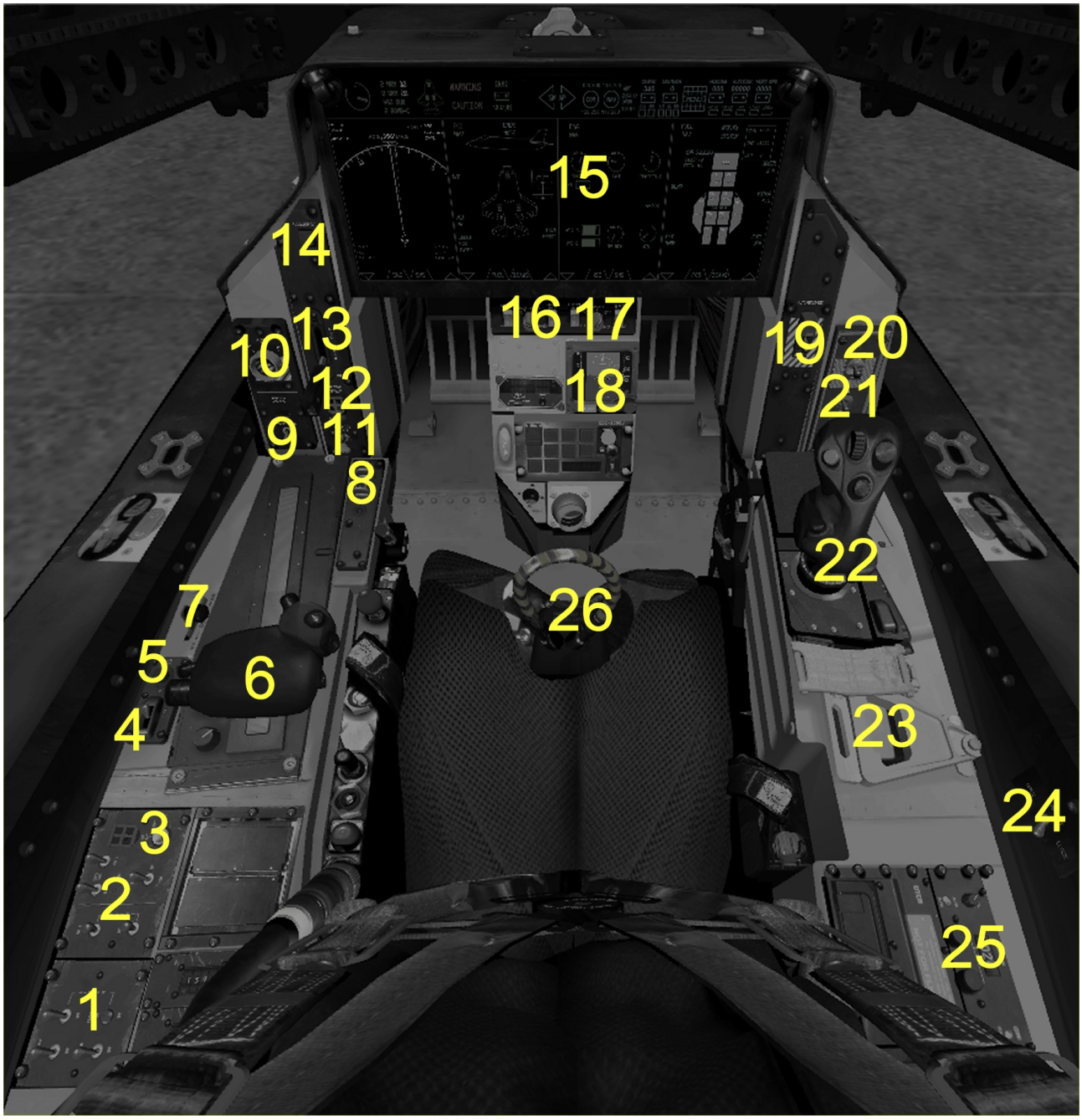
***Load stations numbering***

## COCKPIT

The F-35 features a full-panel-width "panoramic cockpit display" (PCD) glass cockpit, with dimensions of 20 by 8 inches (50 by 20 centimeters). A cockpit speech-recognition system (Direct Voice Input) provided by Adacel is planned to improve the pilot's ability to operate the aircraft over the current-generation interface.The F-35 will be the first US operational fixed-wing aircraft to use this system, although similar systems have been used in AV-8B and trialed in previous US jets, particularly the F-16 VISTA. In development the system has been integrated by Adacel Systems Inc with the speech recognition module supplied by SRI International. The pilot flies the aircraft by means of a right-hand side stick and left-hand throttle.
A helmet-mounted display system (HMDS) will be fitted to all models of the F-35. While some fighters have offered HMDS along with a head up display (HUD), this will be the first time in several decades that a front-line tactical jet fighter has been designed to not carry a HUD.
The Martin-Baker US16E ejection seat is used in all F-35 variants. The US16E seat design balances major performance requirements, including safe-terrain-clearance limits, pilot-load limits, and pilot size. It uses a twin-catapult system that is housed in side rails.

***In-game screenshot of the cockpit***

*Cockpit 3d model and textures are based on high definition photos taken during the construction of F-35 AA-1 prototype, while the canopy inner structure model is based on pictures of the F-35 BF-02. Therefore the actual F-35 can be different in some details. Also, artistic license has been taken in few areas for both product design decisions or FSX limitations.*




*COCKPIT LAYOUT*

*1 – Light control panel (real F-35 has a backup electrical control panel in this area)*
*2 – Battery switch*
*3 – Generator switch*
*4 - Engine fuel valve control (real F-35 has a communication control panel in this area)*
*5 - Engine starter switch (see comment on item 5)*
*6 – HOTAS throttle*
*7 – Defog control lever**
*8 – Rudder trim control switch*
*9 – Parking brake switch*
*10 – Store jettison control**
*11 – Landing light switch*
*12 – Emergency landing gear switch*
*13 – Landing gear lever*
*14 – Emergency arresting hook switch*
*15 – Panoramic Multifunction Display*
*16 – HMDS controls (note: in FSX, clicking in this area will only switch additional 2D information on the HMD)*
*17 – MFD controls (note: in FSX, this knob has the same function of the avionics master switch)*
*18 – Backup ADI display (controls inop)*
*19 – Auto recovery switch**
*20 – Backup battery switch**
*21 – FTA switch**
*22 – HOTAS stick*
*23 – Arm rest**
*24 – Canopy control switch*
*25 – TACAN**
*26 – US16 Ejection seat**

* - These items are purely cosmetic and have no function in Flight Simulator

## PANORAMIC COCKPIT DISPLAY

The core of the F-35 pilot interface is a 20 by 8 inches (50 by 20 centimeters) multifunction touchscreen display. The display layout can be extensively customized by the pilot. The vast majority of the airplane functions can be accessed, controlled, configured and monitored via the multifunction display.

**Due to the lack of documentation, Flight Simulator X limitations and project scope, the multifunction display provided in this package is a much simplified version of the real one, and shows just a fraction of the functions and pages that will be available to the pilots of the F-35.**For the same reasons, some artistic license has been taken in the placement of some controls and functions.

The resulting interface is far from being a realistic and complete rendition of the real F-35 interface. Still, wherever it possible, we tried our best to keep the multifunction display visually and functionally close to the real one and most of the graphics and general layout of the pages are close to their real counterparts.

As shown in the image below, the display layout can be divided in three sections: an upper non-configurable strip and two lower halves, which can be configured to show a variety of information pages. In many cases, those pages can further be split into “minipages”. Below are a couple of possible configurations, that will cover all the available modes (HSI/ENG/SMS/FCS/FUEL/ICAWS). Unless otherwise specified, only the highlighted items are clickable or functional.

MULTIFUNCTION DISPLAY LAYOUT:

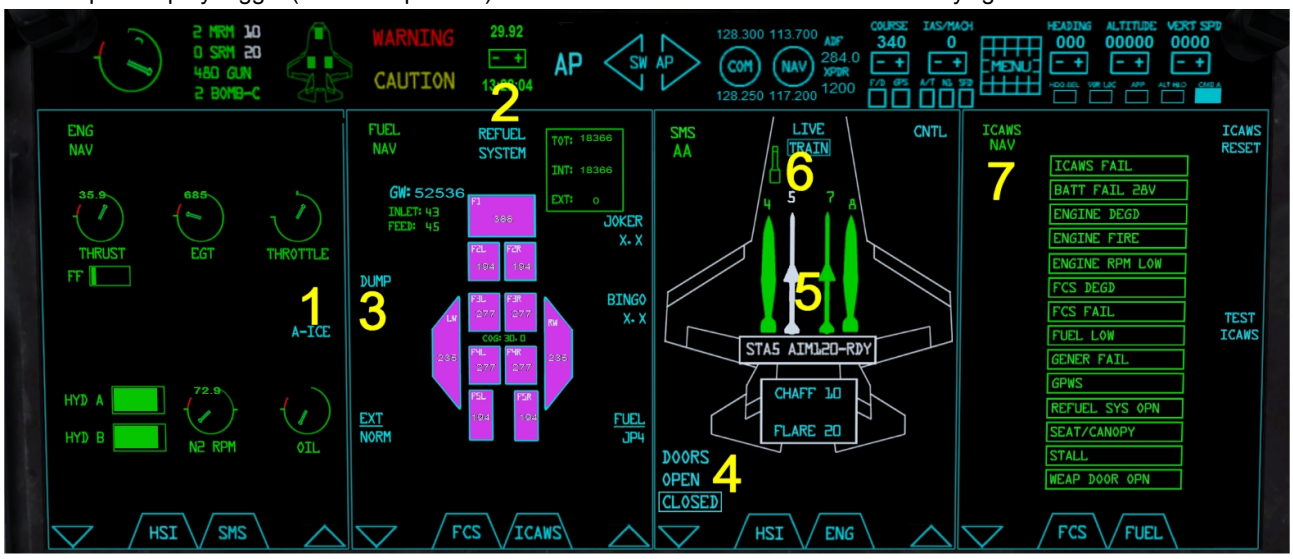
1 – Throttle setting vs N1 RPM
2 – SMS summary*
3 – Landing gear status
4 – Caution and warning lights
5 – Baro setting and clock
6 – Autopilot engaged symbol
7 – Swaps display layout left-to-right
8 – Communication control area**
9 – Autopilot control area ***
10 – Menu (reverts to basic MDF configuration)***
11 – Left half of the MFD (in radar/navigation mode)
12 – Right half of the MFD (showing HSI page, and FUEL page+minipages)
13 – FUEL page configured to show FCS and ICAWS minipages
14 – Page selection tabs
15 - “Down” arrow: if a simple page is shown, pressing this arrow makes the page disappear and the relevant area is occupied by the radar/sensor integration page. If the page has “minipages”, it makes the minipages disappear.
16 - “Up” arrow: makes minipages appear.

* - Not functional in this FSX rendition
** - In the real MFD this is just a summary page. Communication control is done via a pop-up page similar to the F/A-18E/F numeric keypad.
*** - In the real MFD this area hosts miscellaneous information. Autopilot control is done via a pop-up page similar to the F/A-18E/F numeric keypad.
***** - In the real MFD this area activates a pop-up selection grid for quick access to all the MFD pages.

LAYOUT EXAMPLE – 1

In this case, the left half of the MFD is in the radar/navigation mode, which is the top-level page for each of the MFD halves.The right half is split into the Horizontal Situation Indicator and Flight Control System pages.

1 – High Airways display toggle
2 – Low Airways display toggle
3 – VOR display toggle
4 – NDB display toggle
5 – Airport display toggle
6 – Zoom level control
7 – Terrain profile display toggle
8 – Mock A-A shoot list (if A-A weapon selected)
9 – Waypoints display toggle (in HSI/map mode)
10 – VOR display toggle (in HSI/map mode)
11 – Airport display toggle (in HSI/map mode)
12 – HSI mode selection “-” (APP/VOR/MAP)
13 – HSI mode selection “+” (APP/VOR/MAP)
14 – Switches to full radar / navigation mode
15 – Zoom level control
16 – HSI pointer 1 selection
17 – HSI pointer 2 selection
18 – Autopilot switch
19 – Gear and control surfaces status
20 – Control input and trim status (note:trim reset button inop)
21 – Control surface advisory lights




LAYOUT EXAMPLE – 2

In this case, the left half of the MFD is split in the ENGine and FUEL pages, while the right half is split into the Store Management System and Integrated Caution And Warning System.

1 – Anti-ice systems toggle. This is the only clickable item in the ENGine page.
2 – Refuel system toggle. Clicking in this area opens the refuel receptacle (“REFUEL PRE-CNTCT” indicates the receptacle is open). This is a cosmetic-only animation and is mapped to the secondary exit in FSX (default control is SHIFT+E then 2)
3 – Fuel dump switch.
4 – Weapon bays doors control. Clicking in this area toggles the opening/closing of the weapon bays doors. This is a cosmetic-only animation and is mapped to the tertiary exit in FSX (default control is SHIFT+E then 3)
5 – Weapon selection (Cosmetic only) – NOTE: regardless of the external loads in the visual model, this page will show the internal weapons only.
6 – Gun selection (Cosmetic only)
7 – Intergrated Caution And Warning System. The in-game rendition is a much simplified rendition of the real one. This page has no clickable areas.

## HELMET MOUNTED DISPLAY SYSTEM

The F-35 will be the first tactical fighter in fifty years to be operated without an Head Up Display (HUD) – using and Helmet Mounted Display System (HMDS) instead.
The F-35 Helmet Mounted Display System (HMDS) displays biocular video and symbology information on the helmet visor, providing pilots with all information necessary to execute both day and night missions under a single integrated configuration.
The flight data are presented as to the pilot in a Virtual Head Up Display, that is they appear in front of the pilot like if they were on an exceptionally wide, frameless Head Up display. Also,the system enables pilots to accurately cue onboard weapons and sensors using the helmet display. Finally, the system also provides “Enhanced Reality” features, like night vision and the possibility to look “through the aircraft” thanks to the Digital Aperture System (DAS).

In this Flight Simulator X rendition, an accurate and collimated Virtual Head Up display is provided. The VHUD is activated automatically via the Avionics Master switch.
Most of the other HMDS functions are missing, although basic flight data and (cosmetic only) weapon status can be superimposed onto the display so that they follow the headsight. This is done via an additional, superimposed 2D panel which can be switched on by pressing SHIFT+2 or by using the HMDS control in the virtual cockpit. Due to FSX limitation, you will need to re-activate this panel if you change views during the simulation. While this additional panel is more a cosmetic addition than a functional feature, still it give a glimpse of the exceptional situational awareness given by the F-35 cockpit.

**In-game screenshot of the cockpit showing the Head Mounted Display System**

*1 – Virtual Head Up Display – this is an accurate replica of the real F-35 VHUD as seen in images and videos. The VHUD appears collimated and fixed in space, as in the real plane.*
*2 – Superimposed Airspeed, Mach, G and Angle of Attack. This is part of the optional pop-up 2D panel.*
*3 – Superimposed Vertical Speed, Barometric and Radar Altitude.*
*4 – Superimposed weapon status (cosmetic only). This rendition of the F-35 has no weapons features. Also, regardless of the external load, only the internal weapons are shown and can be selected.*
*5 – HMDS control. Unlike the real plane, these controls will only toggle the visibility of items 2) 3) 4). If the users switches to another view, those items will disappear and need to be activated again.*
*6 – Avionics master switch. Unlike the real plane this knob controls both the MFD and the Virtual HUD.*

## FREQUENTLY ASKED QUESTIONS

*Q – Will the F-35B and C be developed as well? And if so, will they be available as free upgrade or as a separate product?*
**A – F-35B and C have always been beyond the scope of this project. The decision to final decision to develop them or not has not been taken yet, but do not expect them to be available anytime soon – and,in case, they will be a separate product (but we are also considering a freeware release of the external visual models only)**

*Q – Special effects, like afterburner flames, are not displayed correctly in DirectX 10 preview mode.Is anything wrong?*
**A – Flight Simulator X: Acceleration DirectX 10 "preview" mode is known to have some glitches and bugs. Unfortunately it has been found that some special effects of the F-35 do not show properly on some machines. Since this is due to glitches in the graphics engine, there is little we can do to fix them.**

*Q – Afterburner effects are peeking through the nozzle geometry. Is anything wrong?*
**A – Afterburner effects use the FSX "special effects" SDK and are fully compliant with that. However the FSX graphics engine is known to slightly misplace such effects on some videocards/system. In most cases, setting the video card to "quality" instead of "performance" will solve the issue. Different videocards may have different drivers, so we cannot provide exact instructions.**

*Q – How can you be sure that this product provides a realistic simulation of the F-35?*
**A – Well, we cannot. Very few individuals have flown the F-35 and the plane is being tested and tweaked as we speak. We tried our best to provide a realistic behaviour, but some guessing had to be done.**

*Q – White navigation light is missing! How could you forget that?*
**A – We did not include the white light just because we were not able to find its location on the real plane... so we preferred to leave it out.**

*Q – Why the external weapons are not appearing on the SMS page?*
**A – Visual models with external weapons are a last-minute, cosmetic only addition. The in-game MFD was not designed to support them.**

*Q – The landing gear contact points are not in their correct positions...is it a mistake or what?*
**A – This is a design choice. If you set the contact points in their right locations (as they were in release 1.05), when the plane was still on the ground in began to shake slightly - this probably due to a contact points instability in FSX physics engine... The only solution we found was to change the contact points location significantly – and they are now quite far off their theoretical positions. Due to customers feedback, we decided to make this the default configuration. An alternate aircraft.cfg is provided if you prefer correct contact points and can live with the micro-oscillations.**

*Q – Is there a way to change the TEXTURE_MAX_LOAD=4096 permanently in the FSX.cfg.*
**A – As far as we know, there is no way to make that a permanent change without using additional software. Every time you change the FSX settings, that value will be brought**

**back to 1024. For example, Texture Max Load Editor from Frosty Software is a freeware solution to this problem – you should be able to find it via Google.**

*Q – What's the FSX.cfg, again? I can't find that file on my system!*
**A – The FSX.cfg is a file used by Flight Simulator X in order to store some of its settings, including some that are not accessible through the in-game menu.**
**The file resides in a hidden folder, whose location varies depending on the operative system and installation language. Please use Google to find a procedure that best fits to your case.**
**If you are not an advanced user, we recommend you not to modify the FSX.cfg, as it is possible to alter it in such ways that will make Flight Simulator not usable.**

**This package, as some other add-ons, employs textures up to 4096x4096 pixel, while the maximum Flight Simulator setting is 1024x1024.**
**If you know how to change the FSX.cfg, you can edit the relevant line as follows:**

**TEXTURE_MAX_LOAD=4096**

**PLEASE NOTE THAT DOING SO, THE MEMORY USAGE GROWS CONSIDERABLY, AND MAY LEAD TO OUT-OF-MEMORY ERRORS.**
**Also, in many cases (i.e. depending on screen resolution, point of view and settings), there visual improvement is small – therefore you may want to leave the default settings.**

*Q – Is there a repaint kit for the F-35?*
**A – No. Due to the photoreal texture creation process we used, no paintkit was done. Still there is a "clean" texture set that, in our hopes, will provide a reasonable starting point for the repainters. We are looking forward to see the amazing liveries that the community will create.**

*Q – Are you planning to update the package so that weapons will be functional in FSX?*
**A – No. Although it is possible, in Flight Simulator X, to have a limited weapon functionality, this feature is not included in the project, no plan to integrate it in future.**

*Q – Are there additional features planned for future updates?*
**A – No. We will surely listen to the users' feedback and needs, and will release patches or fixes if necessary (and we hope it won't be necessary), but apart from those we do not plan to upgrade the product or add features.**

*Q – So what are your plans for the future?*
**A – At present, we do not have the time and the resources to start new projects. What we will do next is a major upgrade to our existing freeware projects (the T-45C Goshawk and the F-14D Tomcat).**
**Such upgrades will absorb all the development time we can afford for at least another year or so.**
**We love flight simulation, and we love making addons and design planes. However, the time required to design a good add-on plane is getting bigger and bigger, so that, at present, at several hundred work-hours are needed to make even a simple plane.**
**We will do our best to continue this activity, but, as the future of the Flight Simulator franchise is unclear, we will consider carefully each new project.**

## CREDITS

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The 3D model of the F-35 is loosely based on 3d data by Camelot Inc., acquired through Falling Pixel and used as reference in the modeling.
This manual includes public domain text and pictures taken from Wikipedia.
Thanks to Orion Lyau for his corrections to the product manual.

## DISCLAIMER

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It is allowed to copy, modify and distribute the texture files ONLY to create new liveries for the visual model featured in this package.

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